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APPLICATION NO.	FILED DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/651,880	08/30/2000	Stephen Marschner	MSI-546US	1905

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EXAMINER

SEALEY, LANCE W

ART UNIT	PAPER NUMBER
2671	5

DATE MAILED: 03/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/651,880	MARSCHNER ET AL.
Examiner	Art Unit	
Lance W. Sealey	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 30 August 2000.

2a) This action is **FINAL**. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-51 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) 29-45 is/are allowed.

6) Claim(s) 1-5, 10, 19-28 and 46-51 is/are rejected.

7) Claim(s) 6-9 and 11-18 is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some * c) None of:

1. Certified copies of the priority documents have been received.

2. Certified copies of the priority documents have been received in Application No. _____.

3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) The translation of the foreign language provisional application has been received.

15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) Notice of References Cited (PTO-892)

2) Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.

4) Interview Summary (PTO-413) Paper No(s) _____.

5) Notice of Informal Patent Application (PTO-152)

6) Other: _____

DETAILED ACTION

Objection to Color Drawings

1. The application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.
2. The drawings are considered to be informal because they fail to comply with 37 CFR 1.84(a)(1) which requires black and white drawings using India ink or its equivalent.
3. Photographs and color drawings are acceptable only for examination purposes unless a petition filed under 37 CFR 1.84(a)(2) or (b)(1) is granted permitting their use as formal drawings. In the event applicant wishes to use the drawings currently on file as formal drawings, a petition must be filed for acceptance of the photographs or color drawings as formal drawings. Any such petition must be accompanied by the appropriate fee as set forth in 37 CFR 1.17(i), three sets of drawings or photographs, as appropriate, and, if filed under the provisions of 37 CFR 1.84(a)(2), an amendment to the first paragraph of the brief description of the drawings section of the specification which states:
 4. The file of this patent contains at least one drawing executed in color. Copies of this patent with color drawing(s) will be provided by the Patent & Trademark Office upon request and payment of the necessary fee.
 5. Color photographs will be accepted if the conditions for accepting color drawings has been satisfied.

Allowed and Allowable Subject Matter

6. Claims 29-45 are allowed, and claims 6-9 and 11-18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter: No prior art anticipates or suggests, in a facial expression transformation system, a second code book in addition to a first code book and a training system of expressions (claim 29). Nor does any prior art anticipate or suggest, in a facial expression transformation method, computing a set of linear predictors a_j , one for each coordinate of g_a , given a set of n expression vectors for a face to be transformed, $g_{a1\dots n}$, and a corresponding set of vectors for a target face, $g_{b1\dots n}$, by solving $3m$ linear least square systems of the form $a_j \cdot g_{ai} = g_{bi}[j], i=1\dots n$, wherein said computing comprises using only a subset of points for each g_{aj} . (claim 6), controlling the spread of singular values when computing a pseudoinverse to solve for the a_j (claim 8), projecting a pattern onto a face for the purpose of ascertaining structure data (claim 11), capturing both specularly-suppressed reflection data and structure data from the simultaneous illumination of a second person's face with one light source that is polarized and one structured light source that projects a pattern onto the face (claim 12), and processing surface normals and image data to derive an albedo map in the process of providing data defining a second set of facial expressions (claim 16). Claims 30-45 are allowed, and claims 7, 9, 13-15 and 17-18 are allowable, because they depend on claims

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29, 6, 8, 12 and 16, respectively.

Claim Rejections - 35 USC §102

8. The following is a quotation of 35 U.S.C. 102(e) which forms the basis for all novelty-related rejections set forth in this Office action:

A person shall be entitled to a patent unless—

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by applicant for patent.

9. Claims 19-28 are rejected under 35 U.S.C. 102(e) as being anticipated by LaChapelle (U.S. Pat. No. 6,163,322).

10. LaChapelle, in disclosing a method and apparatus for providing a real-time animation utilizing a database of postures, also discloses, with respect to claim 19, one or more computer-readable media having computer-readable instructions thereon which, when executed by a computer, cause the computer to:

- operate on a training set of expressions from one person (database of expressions; col.8, ll.22-25) and corresponding expressions from a code book of another person (col.4, ll.29-46) to compute a linear transformation function from the training set and their corresponding expressions (mapping template; col.9, ll.43-51. The neutral facial expression E_0 is the source of the facial expressions in the database; see col.8, ll.45-48); and apply the transformation function to a plurality of expressions from the code book to provide a synthetic set of expressions (col.13, ll.49-65).

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11. Concerning claim 20, LaChapelle further discloses the instructions causing the computer to use the synthetic set of expressions to transform expressions from the one person into expressions of the other person (col.9, ll.43-51).

12. Regarding claim 21, LaChapelle further discloses instructions causing the computer to transform expressions from the one person that are different from those expressions comprising the code book expressions (mapping template, col.9, ll.43-51).

13. With respect to claim 22, LaChapelle further discloses instructions causing the computer to transform expressions from the one person that are different from those expressions comprising the code book expressions (markers, col.9, ll.43-47).

14. Regarding claim 23, LaChapelle further discloses instructions causing the computer to transform facial expressions (mapping template, col.9, ll.43-51).

15. Concerning claim 24, LaChapelle further discloses a facial expression transformation system comprising:

- a code book embodied on a computer-readable medium, the code book containing data defining a first set of facial expressions of a first person (col.4, ll.29-46);
- data embodied on a computer-readable medium, the data defining a second set of facial expressions, the second set of facial expressions providing a training set of expressions of a second person who is different from the first person (database of expressions; col.8, ll.22-25); and

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- a transformation processor configured to derive a transformation function from the training set of expressions and corresponding expressions from the first set of expressions (mapping template, col.9, ll.43-51. The neutral facial expression E_0 is the source of the facial expressions in the database; see col.8, ll.45-48).

16. Regarding claim 25, LaChapelle further discloses the transformation processor comprising a linear transformation processor (col.10, ll.34-38).

17. With respect to claim 26, LaChapelle further discloses the expression transformation system comprising a synthetic set of expressions embodied on a computer-readable medium, the synthetic set of expressions being derived by applying the transformation function to the code book expressions (col.9, ll.43-51).

18. Concerning claim 27, LaChapelle further discloses the transformation function compensating for differences in the size and shape of the faces of the first and second persons (col.10, ll.54-57).

19. Finally, regarding claim 28, LaChapelle further discloses the transformation processor deriving the transformation function by:

- representing each expression as a $3m$ -vector that contains x , y , z displacements at m standard sample positions (, col.4, ll.63-66); and
- computing a set of linear predictors a_j , one for each coordinate of g_a , given a set of n expression vectors for a face to be transformed, $g_{a1...n}$, and a corresponding set of vectors

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for a target face, $g_{b1\dots n}$, by solving $3m$ linear least squares systems of the form: $a_j \cdot g_{ai} = g_{bi}[j], i=1\dots n$ (computation of in col.5, ll.8-18).

20. Therefore, in view of the foregoing, claims 19-28 are rejected as being anticipated under 35 U.S.C. 102 by LaChapelle.

Claim Rejections - 35 USC § 103

21. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Patentability shall not be negated by the manner in which the invention was made.

22. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over LaChapelle in view of Georgiev (U.S. Pat. No. 6,351,269).

23. LaChapelle discloses, with respect to claim 1, a facial expression transformation method comprising:

- defining a code book containing data defining a first set of facial expressions of a first person (col.4, ll.29-46);
- providing data defining a second set of facial expressions, the second set of facial expressions providing a training set of expressions of a second person who is different

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from the first person (database of expressions; col.8, ll.22-25); and

- deriving a transformation function the training set of expressions and corresponding expressions from the first set of expressions (mapping template, col.9, ll.43-51).

24. However, LaChapelle does not disclose applying the transformation function to the first set of expressions to provide a synthetic set of expressions. This element is disclosed by the Georgiev method of multiple image morphing at col.4, ll.47-61.

25. Therefore, it would have been obvious to one of ordinary skill in the art to incorporate the Georgiev morphing method into the LaChapelle animation method. This would provide flexibility in modifying images (Georgiev, col.4, ll.61-65).

26. The other claims in this rejection will now be considered. Concerning claim 2, LaChapelle discloses the training set of expressions as containing fewer expressions than the code book (this is possible because creation of the number of expressions via tracking movements of the face of a performer does not depend on the number of expressions in the database. See col.4, ll.29-46.).

27. Concerning claim 3, LaChapelle further discloses the transformation function compensating for differences in the size and shape of the faces of the first and second persons (col.10, ll.54-57).

28. Regarding claim 4, LaChapelle further discloses the derivation of the transformation function comprising a linear transformation processor (col.10, ll.34-38).

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29. Finally, regarding claim 5, LaChapelle further discloses the transformation processor deriving the transformation function by:

- representing each expression as a $3m$ -vector that contains x, y, z displacements at m standard sample positions (i , col.4, ll.63-66); and
- computing a set of linear predictors a_j , one for each coordinate of g_a , given a set of n expression vectors for a face to be transformed, $g_{a1...n}$, and a corresponding set of vectors for a target face, $g_{b1...n}$, by solving $3m$ linear least squares systems of the form: $a_j \cdot g_{ai} = g_{bi}[j], i=1...n$ (computation of in col.5, ll.8-18).

30. Therefore, in view of the foregoing, claims 1-5 are rejected as being unpatentable under 35 U.S.C. 103 by LaChapelle and Georgiev.

31. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over LaChapelle in view of Georgiev and further in view of Parke et al., Computer Facial Animation (“Parke”).

32. Neither LaChapelle nor Georgiev disclose illuminating the second person’s face with illumination and contemporaneously capturing structure data describing the face’s structure and reflectance data describing reflectance properties of the face from the illumination. However, these elements are disclosed by the Parke animation textbook. Illuminating the second person’s face is disclosed by Parke in Section 5.7.2, pp.183-185, and capturing the structure data is disclosed by Parke at Section 5.6, p.170, first full paragraph.

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33. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to incorporate the illumination elements of Parke into the LaChapelle-Georgiev animation apparatus. This would provide optimal lighting for whatever purpose is needed (Parke, pp.183-185).

34. Therefore, in view of the foregoing, claim 10 is rejected as being unpatentable under 35 U.S.C. 103 by LaChapelle, Georgiev and Parke.

35. Finally, claims 46-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Parke in view of Georgiev.

36. Parke further discloses a method of animating facial features comprising defining a subdivision surface that approximates geometry of a plurality of different faces on p.94 in the section marked "Fixed Topology".

37. However, Parke does not disclose fitting the same subdivision surface to each of the plurality of faces to establish a correspondence between faces and using the correspondence between the faces to transform an expression of one face into an expression of another face. These elements are disclosed by Georgiev at col.4, ll.47-61.

38. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to incorporate the Georgiev method of establishing correspondence between faces into the Parke method of modeling. This would provide flexibility in modifying images (Georgiev, col.4, ll.61-65).

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39. The other claims in this rejection will now be considered. With respect to claim 47,

Parke discloses:

- measuring 3-dimensional data for a plurality of different faces to provide corresponding face models (Section 3.4, p.66, first sentence of first paragraph and first bullet);
- defining only one generic face model that is to be used to map to each corresponding face model (p.94, section marked “Fixed Topology”); and
- selecting a plurality of points on the generic face model that are to be mapped directly to corresponding points on each of the corresponding face models (p.94, section marked “Fixed Topology”, selection implied by second sentence).

40. However, Parke does not disclose fitting the generic face model to each of the corresponding face models, said fitting comprising mapping each of the selected points directly to the corresponding points on each of the corresponding face models. This element is disclosed by Georgiev at col.4, ll.47-61.

41. Therefore, it would have been obvious to one of ordinary skill in the art at the time this invention was made to incorporate the Georgiev method of fitting the generic face model to the corresponding face model into the Parke method of modeling. This would provide flexibility in modifying images (Georgiev, col.4, ll.61-65).

42. The other claims in this rejection will now be considered. Concerning claim 48, Parke discloses defining a subdivision surface from a base mesh structure, the subdivision surface

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containing a plurality of vertices and approximating the geometry of the face models (p.95, Figure 3.17 and first full paragraph); and manipulating only the positions of the vertices of the subdivision surface (p.94, section marked “Fixed Topology”, next to the last sentence).

43. Regarding claims 49 and 50, Parke discloses manipulating a base mesh that defines a subdivision surface without altering the connectivity of the base mesh (p.94, section marked “Fixed Topology”, next to the last sentence).

44. Finally, regarding claim 51, Parke discloses using a laser range scan to measure the 3-dimensional data at p.78, Section 3.7, first two sentences.

45. Therefore, in view of the foregoing, claims 46-51 are rejected as being unpatentable under 35 U.S.C. 103 by Parke and Georgiev.

Conclusion

Any inquiry concerning this communication or earlier communications from the Office should be directed to the examiner, Lance Sealey, whose telephone number is (703) 305-0026. He can be reached from 7:00 am-3:30 pm Monday-Friday EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman, can be reached at (703) 305-9798.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

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Washington, D.C. 20231

or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office at (703) 306-0377.

Respectfully submitted,

Lance W. Sealey, examiner